

## Introduction

- If a sentence has a word that violates semantic or world knowledge, N400 appears (Hagoort et al., 2004)
- Our study presented in this paper used electroencephalography (EEG) to confirm whether Japanese sentences cause N400 ERP component

## Method

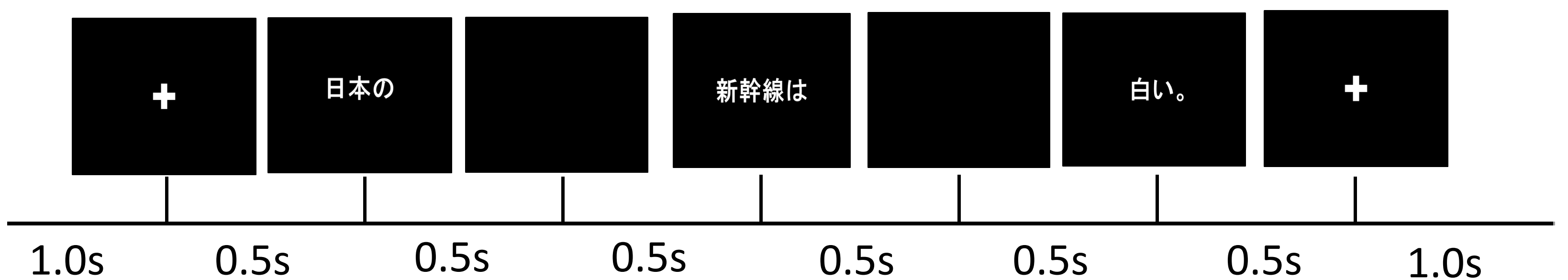
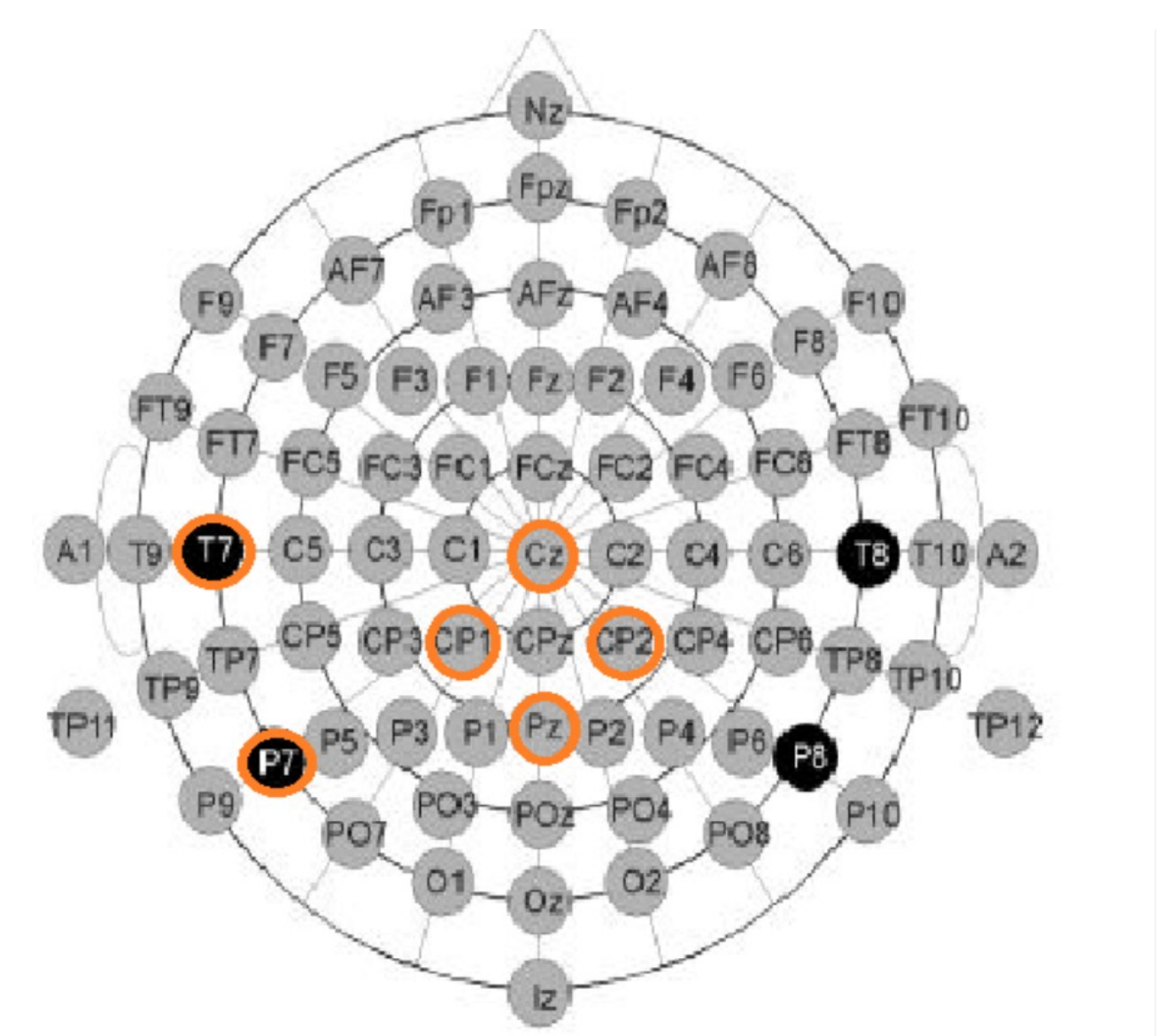
- Presented three kinds of sentences as visual stimuli are sentences (3 × 90 sentences)
  1. Completely correct sentences
  2. A word that violated world knowledge
  3. A word that violated semantics

### Critical word Stimuli

- 1) **Correct** : understandable and correct  
Japanese Shinkansen is white and very fast.  
(新幹線は白くとても速い。)
- 2) **World knowledge violation** : understandable but not true  
Japanese Shinkansen is black and very fast.  
(新幹線は黒くとても速い。)
- 3) **Semantic violation** : has a violation of semantic constraint  
Japanese Shinkansen is irritable and very fast.  
(新幹線は怒りっぽくとても速い。)

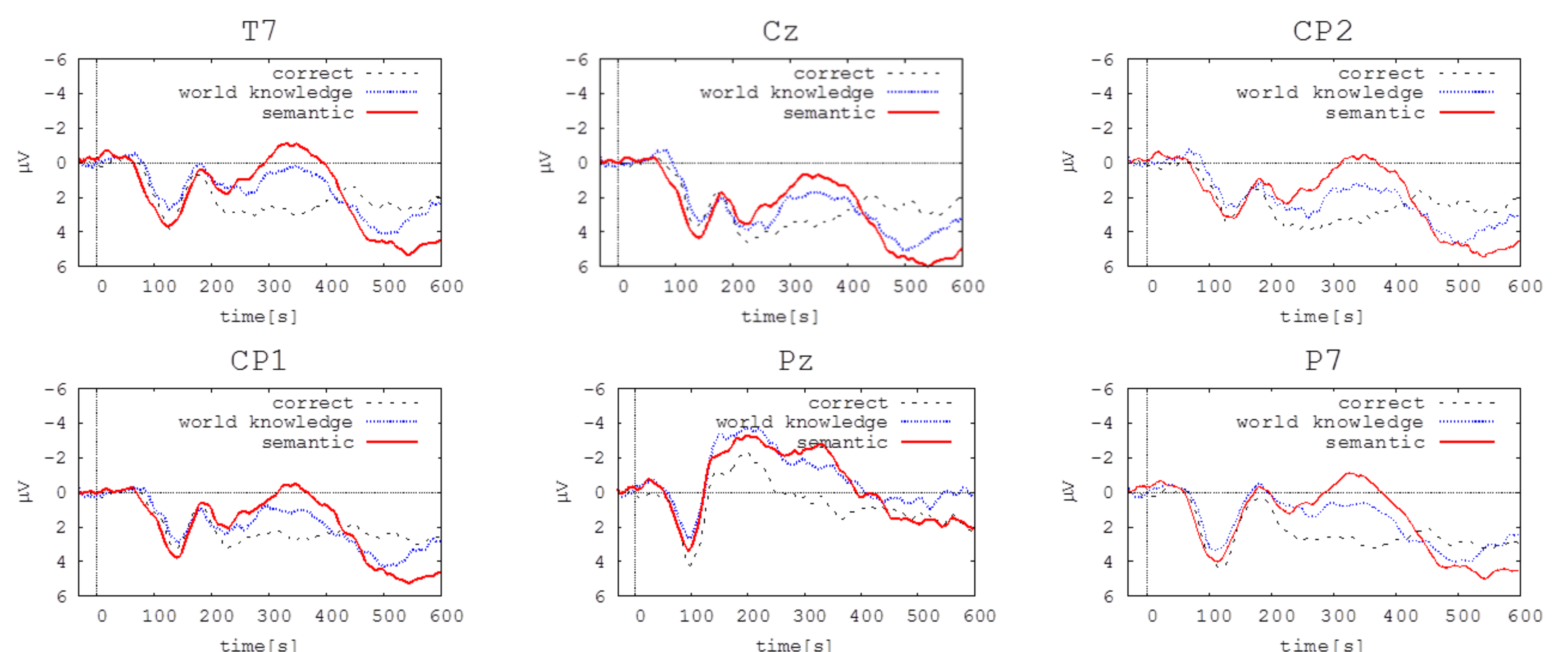
### Participants

- 6 subjects
- Healthy graduate school students
- Native Japanese speaker
- Not have history of psychiatric or neurological illness or alcohol abuse
- No visual deficit
- Each sentence was split into segments
- Each segment was shown for 0.5 sec
- Intervals of segments 0.5 sec



## Result

- Negative shift appeared after critical words
- Previous study (Hagoort et al., 2004):**
  - The peak of this negative shift was shown to occur at about 400 ms
  - World knowledge and semantic had no significant difference
- In this study:**
  - The peak occurred at about 350 ms (Cz)
  - ERPs showed a significant difference between world knowledge and semantic violations



ERPs are time locked to the presentation of the critical word. Difference of three kinds of ERPs were not identical [ $F=3.03, P<0.001$ ]. The size of effect of semantic violations was larger than World knowledge violations ( $P<0.001$ ) and world knowledge violations one was larger than correct ( $p<0.001$ ).

## Discussion

- Early N400 phenomenon indicates that Japanese words can be processed faster than those of Western languages
  - It may be partly due to the processing of Japanese Kanji characters, which also similarly appeared in Chinese study (Zheng Ye et al., 2005).
- Difference of N400 amplitude between world knowledge violation and semantic violations may come from the grammatical form of Japanese
- In Japanese sentences, the reader cannot tell whether a sentence is true or false until the end of a sentence

## Future work

We are going to check these points

- Difference of the N400 amplitude between World Knowledge violation and Semantic violation word
- Early N400 phenomenon (conduct English version of the experiment)

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